Cotton Gin Fires

Caused By Static Electricity

This circular tells how to stop cotton from going up in smoke

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FIRES IN COTTON GINS PREVENTABLE

THE main cause of the frequent and destructive fires in the cotton gins of the South is static, or frictional, electricity—an element easily controlled by simple methods. That is shown by investigations of the United States Department of Agriculture.

This circular tells how to prevent fires from static electricity, and suggests methods for the prevention of fires from matches or other foreign material in cotton, from friction, from cotton hanging to ribs in the gin, or from other possible causes of less importance.

GIN BLAZES TOO FREQUENT

So frequent were the mysterious gin fires—the losses in Texas alone in 1917 being estimated at a million dollars—that rumors of alien enemy activity spread through the country. Whereupon Uncle Sam decided it was high time to discover the why and wherefore of such fires, and how the great supply of cotton destroyed in this manner might be saved for its many uses, and sent several experts to Texas to determine the cause and the preventive.

WHAT CAUSES GIN FIRES?

In the first place, the Government experts inspected some 470 gins, asking the managers for a report on the number of fires they had experienced.

Out of this number, 287 managers reported a total of 607 fires in 1918, the complete details for only 394 of which, however, were available. According to the ginners, matches were responsible for 205 fires, the presence of cotton in the ribs for 25, matches or foreign material for 25, and foreign material for 16. Other causes mentioned were hot boxes, friction, and static electricity, while in 67 cases no definite cause could be given.

TESTING THE MATCH THEORY

From the ginners' statements it seemed that matches did the most harm. Accordingly the match theory was put to the test.

TEST 1.—One forenoon more than 500 matches were placed in a load of cotton when about half of it had been taken from the wagon. The mass of cotton, plus the matches, was then drawn into the suction pipe, by means of which all cotton is carried into the gin. No fires broke out in the cleaner, the pneumatic distributor, the feeders, the stands, the lint flue, or the bale. Two small fires occurred in the

huller breast, but they were easily extinguished by simply lifting the breast and smothering the flames.

TEST 2.—At another gin, one afternoon, 38 marked matches were placed in about 600 pounds of seed cotton, in the seed cotton house, whence they were drawn along with the cotton into the cleaner. The feeders were shut off, thus forcing the cotton out through the overflow. No fires occurred anywhere.

Then 47 more matches were added to the cotton on the overflow, and the whole thing drawn again into the cleaner. But this time the feeders were opened, and the cotton fed into the gins in the usual way. Again no fires were observed in the cleaner, the belt distributor, the feeders, the gin stands, the lint flue, or the bale. As in Test 1, however, two small fires occurred in the huller breast and were as readily put out.

In these two tests, nearly 600 matches passed through the systems without creating a fire anywhere except in the huller breasts. Even here there were only four small ones.

FALLACY OF MATCH THEORY

Assuming that one match in every 600 present in cotton can be counted on to start a fire in the cleaner, where a blaze is far more serious than one in the huller breast, the cotton destroyed in the 470 gins visited by the representatives of the Department must have contained 207,600 matches—not a very likely circumstance. To put it in another way. Certain gins having reported from 50 to 100 fires, it seemed fair to assume that five fires to each gin in Texas in 1917 constituted a conservative average. That would mean a total of 20,000 fires, varying in magnitude, for that one State. If it were true that all these fires were due to the presence of matches in the cotton, fully 12,000,000 matches must in some manner have found their way into the Texas cotton crop!

STATIC ELECTRICITY INVESTIGATED

The results of the two tests made the Government investigators a bit skeptical as to the soundness of the match theory, and they straightway began to cast about for some more likely one.

Now, in the investigations of fires in grain mills, elevators, and thrashing machines, the Department of Agriculture representatives found that static electricity was responsible for many explosions and fires. Their suspicions that this form of electricity might also play a part in the cotton gin fires were borne out by the statement of the ginners that most of their fires occur in clear, dry weather, while practically all such trouble ceases with the coming of the fall rains. Most of the fires in 1917 and 1918 occurred in periods of drouth and low humidity.

WHAT IS STATIC ELECTRICITY?

Friction between any two dissimilar bodies produces static, or, as it is sometimes called, frictional electricity. To illustrate:

Many of us, on a day when the moisture in the atmosphere is conspicuous by its absence, have tried the trick of shuffling rapidly over a carpeted floor, to grasp some metal object, thus receiving a distinct electrical shock. What produces this shock? Not the metal, as some have thought, for if touched without the preliminary shuffling no shock is felt. The friction of the feet on the carpet produces a charge, or a series of charges, of static electricity, which accumulate in the body. Contact with any metal object causes this electricity to be discharged, with a slight shock.

Again, when a comb is run through the hair on a dry day, especially if a rubber comb is used, and the hair is perfectly dry, each individual hair seems to stand up alone and refuses to go smoothly into place. This is due to the charge of static electricity generated by the friction of the comb against the hair.

One might be inclined to assume that a dry atmosphere is essential to the production of the electrical charge. As a matter of fact, however, the electricity is generated just the same, no matter whether the air is dry or moist. But moist air is one of the so-called conductors of electricity, so that when the weather is damp the charges usually are led off as fast as they are formed. Dry air, which does not act as a conductor of electricity, permits the charges to accumulate in the charged body until contact with some less highly electrified body causes it to discharge.

Bringing the case down to the cotton gin, it has been the experience of almost every ginner that during periods of drouth and low humidity static electricity is present on all metallic parts of the gin. Frequently the first man about the place to notice it is the suction feeder, who receives a shock from the suction pipe. Then the oiler finds that his can gets a shock as he brings it near the bearings, especially those of the cleaner. A man passing beneath a belt often feels his hair rise, and, upon approaching more closely, experiences a prickly sensation, as if some one were sticking pins in him. Sometimes a blue haze plays between the pulley and the belt at the point where the belt leaves the pulley, and again sparks are seen to fly through this part of the machinery.

WHAT STATIC ELECTRICITY DOES TO COTTON

A series of tests carried out by the Department showed definitely that both seed cotton and lint cotton can be ignited by static electricity, provided the cotton is fairly dry and the sparks frequent enough. While the sparks sometimes drawn from the belt may not ordinarily

ignite the cotton, it is highly probable that a continuous procession of such sparks, which at first char and darken the cotton, will eventually set it on fire. Unquestionably, however, cotton is ignited by the sparks of static electricity which jump between the metallic parts of the machinery.

Static electricity may also cause fires indirectly. It has been demonstrated that cotton is held to electrified bodies, such as lint flues charged with static electricity, from which it is removed only with difficulty as long as the body retains its charge. Many fires have been traced to the hanging of cotton in the ribs, as well as to the sticking of the cotton to the lint flue and various other places, filling them in such a way as to produce friction, which ultimately causes a fire.

This whole question is still under investigation and further results will be made public as they become available.

HOW TO ELIMINATE STATIC ELECTRICITY

During its investigations, the Department found that in a few cases, in 1917 and also previous to that time, static electricity had assumed such menacing proportions that the ginners were forced to take steps to remove it from their plants. In some instances it was present in such quantities as to interfere seriously with the operation of the plant, either by making it impossible for the men to touch the machinery or by causing the cotton to cling to the machinery, thus clogging the parts. Fires also were very common.

A few ginners removed the static electricity by hanging wet bagging in the buildings, some by wetting down the plant and grounds every day, or even twice a day, and some by injecting a little steam into the suction pipe in the direction of the flow of cotton, while a few grounded the machinery. To the surprise of many of these ginners, effective operation of any one of these methods seemed to put an end to their trouble with fire.

GROUNDING MACHINERY RECOMMENDED

Of all the methods for the elimination of static electricity, the one recommended by the Department of Agriculture is the grounding of the machinery, which may be done in this way:

Connect all metal parts of the gin by No. 10 insulated copper wire Run at least three heavier insulated wires (No. 14) to underground water pipes, or to rods driven 4 or 5 feet or more into the ground. Starting from the suction pipe, make contacts to the telescope pipe, on the flange, just below the canvas joint, with one or two more contacts between it and the cleaner, depending on the length of the pipe. Run this wire on into the cleaner, making contacts to all the screens—two on the larger ones—as well as to all journal boxes on

at least one side of the cleaner. Bring the wires from these contact points together. From here run a wire to all journal boxes on one side of each feeder and gin stand, to the screens of the cleaner

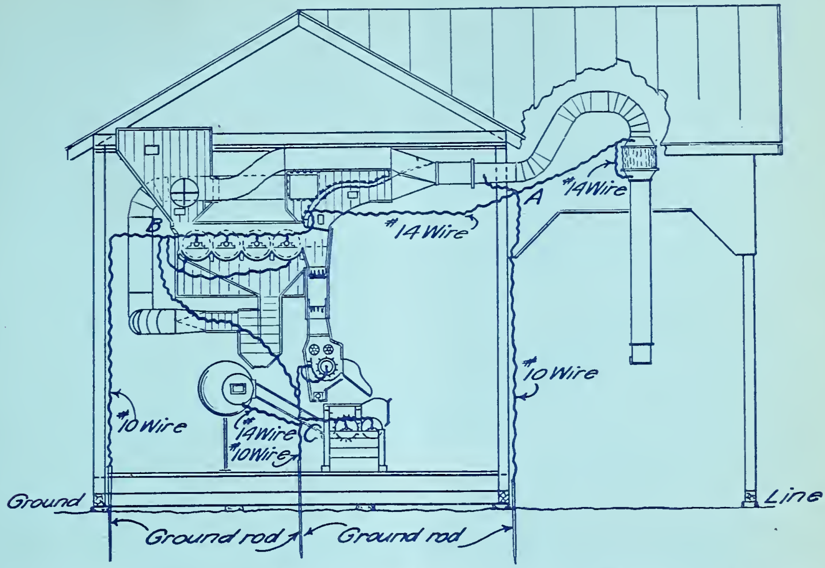

FIG. 1.—One method for wiring cotton gin machinery in such a way that the static electricity generated by the friction of the machinery will be conducted harmlessly into the ground.

feeders, and to the lint flue, bringing wires from these points together. Contacts should also be made to the overflow, telescope, and suction pipe. Connect these wires with the ground wires at the following points: (A) Where the wires from the suction pipe meet; (B) where the cleaner connections come together; and (C) where the connections from the stands, feeders, and lint flue are brought together (Fig. 1).

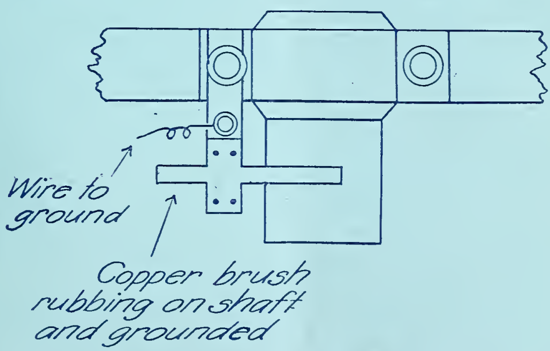

FIG. 2.—Brush contacts should be used on revolving shafts.

How to make all contacts.—Remove the insulation from the wire, and scrape bright the bared metal at the point of contact, taking care that all dirt, oil, and rust are removed. The contacts must be made as tight as possible. Whenever possible, brush contacts (Fig. 2) should be used on revolving shafts, rather than simply making a connection to the journal box. Solder all connections in the grounding rods.

A DOZEN RULES TO PREVENT GIN FIRES

The cotton ginner has it in his power to render his plant practically immune from destructive fires if he will—

1. Thoroughly ground all metal and moving parts of the gin, thus eliminating the static electricity.

2. Educate the neighboring farmers and cotton pickers to keep the cotton as free as possible from matches and other foreign material.

3. Clean the plant thoroughly at least three times a week, thus freeing the premises from lint, through which fire spreads rapidly.

4. Refuse to gin wet or even damp cotton, which tends to hang in the ribs and produce friction.

5. Keep the huller ribs and the gin ribs as clean as possible, and the saws sharp.

6. Clean out the condenser every night and immediately after all fires.

7. Inspect all parts of the plant after closing, lest some hot box or smouldering cotton give rise to a fire.

8. Use automatic oilers on all bearings, thus preventing hot boxes and the dripping of oil from the boxes on accumulated lint or seed cotton, with the resultant spontaneous combustion, and at the same time effecting an economy in the amount of oil used.

9. Store no baled cotton on the platform or at a distance less than 100 feet from any building.

10. Prohibit smoking and carrying matches in or around the plant.

11. Keep ample and efficient fire-fighting apparatus easily available at all times.

12. Keep all machinery in proper alignment.